

# THERMA-FEED BOILER FEED SYSTEM

SPECIFICATION SHEET NO. 3100

JUNE 1, 1996

## GENERAL DESCRIPTION

The Thermo-Feed is an economical prefabricated boiler feed system utilizing the direct injection of live steam into the stored water to heat the boiler feed-water to 205-208 ° F. Heating the water up to these levels effectively drives off up to 90% of excess dissolved oxygen contained in raw water makeup without creating an excessive vent loss. The live steam is admitted to the water through a corrosion resistant perforated diffuser tube. It is controlled by a highly sensitive, pneumatic, combination temperature-pressure regulating valve suitable for use with supply pressures of 6 psig to as high as 250 psig.

The receiver shell is constructed of extra heavy pressure vessel quality steel in thicknesses generally exceeding those of conventional feed systems. This provides greater corrosion allowance and longer service. Each receiver is protected with a baked on epoxy-phenolic lining and a replaceable magnesium anode. A heavy duty welded structural steel stand with integral pump supports is provided to hold the receiver securely. Larger receivers are furnished with a 16" diameter manhole and other necessary tapings to suit installation requirements. Handholes are installed in 30" diameter or smaller shells. Top shell inlet openings are equipped with a dispersion baffle.

Makeup water is admitted to the system through a float operated feeder on all units up to 250 H.P. capacity. A solenoid valve operated by a probe type controller is used on larger systems. All makeup valves are sized to deliver 100% of system capacity rating at a minimum supply pressure of 40 psig at the valve inlet.

Boiler feed pumps are heavy duty industrial type designed for low N.P.S.H. service and are driven by standard open drip proof motors unless otherwise specified. Refer to pump bulletin for descriptive data and specifications.

Each Sellers Thermo-Feed System is shipped completely prefabricated on an integral support stand. An operational factory test and inspection is completed prior to shipment.

## MODEL NUMBER SELECTION

To select a model number determine the total system rating in terms of boiler horsepower.

(100 B.H.P. = 6.9 GPM = 3450 lbs./hr.)

Select the base system model number from the table below and to it, add the appropriate code letters to define the pumps and heating assembly.

### EXAMPLE

Assume a process plant is installing (2) 150 H.P. boilers operating a minimum pressure of 100 psig (maximum 120 psig). Half of total load is used in the process, resulting in a makeup requirement of 50% (10.35 GPM). The available makeup water supply is at a minimum temperature of 40 ° F. The balance of the system load is recovered and returned to the receiver with gravity or condensate pumps at a minimum temperature if 160 ° F. The blend temperature of the water in storage is 100 ° F. The required heater capacity is sized and selected by the procedure shown on Page 2 & 3 based on heating capacity required (105 deg. F) and 100 psig minimum steam supply.

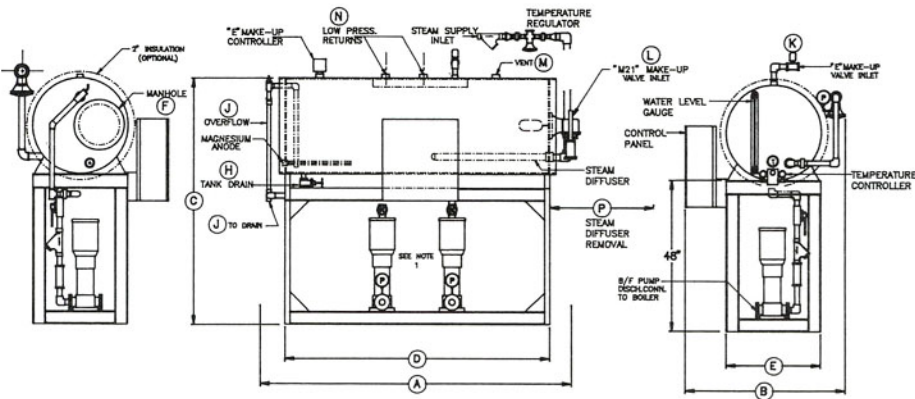
It is further assumed that each boiler is to be fed by its respective feed pump with provision for either pump to feed either boiler. (See pump bulletin for sizing and selection procedure.) The complete system model number is specified as follows:

T - 300	(2) - (x)	TH4E
- Base system model	- Pump code from	Heating
number defines	pump bulletin	assembly
system type and	indicates quantity	model from
total boiler horse-	and type of pumps	Chart II
power rating		

## THERMA-FEED SYSTEM CAPACITY RATINGS

Base system model is selected from the following table. The model selected should be suitable for the total system design horsepower load or total boiler load in lbs. steam per hour.

BASE SYSTEM MODEL NUMBER	CAPACITY POUNDS PER HOUR	G.P.M.	RECEIVER (I.D. x Length) INCHES	CAPACITY			MAKEUP VALVES	
				FLOODED GALLONS	TO OVERFLOW		MODEL	SIZE
					GALLONS	MINUTES		
T-100	3450	6.9	27 x 36	87	73	10.6	M21	3/4"
T-150	5175	10.4	24 x 66	132	108	10.2	M21	3/4"
T-200	6900	13.8	30 x 60	181	155	11.3	M21	3/4"
T-250	8625	17.3	30 x 66	206	176	10.2	M21	3/4"
T-300	10350	20.7	30 x 84	255	218	10.6	E3	3/4"
T-350	12075	24.2	30 x 96	281	250	10.3	E3	3/4"
T-400	13800	27.6	30 x 104	316	271	9.8	E3	3/4"
T-500	17250	34.5	36 x 104	455	405	11.7	E4	1"
T-600	20700	41.4	42 x 84	489	456	11	E4	1"
T-800	27600	55.2	42 x 104	619	565	10.2	E4	1"
T-1000	34500	69	46 x 104	809	751	10.9	E4	1"
T-1200	41400	82.8	48 x 120	934	867	10.5	E5	1 1/4"
T-1600	62100	124.2	60 x 120	1460	1364	11.1	E6	1 1/2"



BASE MODEL NUMBER	O.A. A	O.A. B	O.A.H. C	LGT. D	O.D. E	F	H	J	K	L	M	N	MAX. P
T-100	46	40	75	36	27	-	1	1.25	-	0.75	1.5	1.5	28
T-150	82	37	72	72	24	-	1	1.25	-	0.75	1.5	1.5	46
T-200	70	43	78	60	30	-	1.25	1.5	-	0.75	2	1.5	60
T-250	76	43	78	66	30	-	1.25	1.5	-	0.75	2	2	60
T-300	96	43	78	84	30	-	1.25	1.5	0.75	-	2	2	60
T-350	108	43	78	96	30	-	1.25	1.5	0.75	-	2	2	60
T-400	96	50	84	84	36	X	1.5	2	0.75	-	2.5	2.5	60
T-500	96	56	90	84	42	X	1.5	2	1	-	3	3	60
T-600	96	56	90	84	42	X	1.5	2	1	-	3	3	60
T-800	120	56	90	104	42	X	1.5	2	1	-	3	3	60
T-1000	120	66	96	104	48	X	2	2.5	1	-	4	4	60
T-1200	134	66	96	120	48	X	2	2.5	1.25	-	4	4	60
T-1800	134	76	108	120	60	X	2.5	3	1.5	-	4	4	60

#### NOTES:

- (1) Pump orientation is typical. Quantity and type of pumps will determine final orientation.
- (2) Dimensions A through E are approximate and may vary depending on options furnished.

### THERMA-FEED HEATING ASSEMBLY SELECTION GUIDE

Heating Assembly should be sized to take care of total system input load. Makeup water and all low temperature returns require heating. High temperature returns and drips coming back at temperatures in excess of

212° F. need not be heated and should be admitted below water level through a diffuser tube.

#### STEP 1.

Calculate tank blend temperature and required heat rise based on minimum temperature input:

EXAMPLE:

Total load = 300 H.P. (10350) = 20.7 GPM

Minimum steam supply pressure = 100 psig

50% makeup at 40° F = 10.35 GPM

50% returns at 160° F = 10.35 GPM

.5 x 40° F = 20° F

.5 x 160° F = 80° F

Blend temperature = 100° F

Required temperature rise = 205° F - 100° F = 105° F.

#### STEP 2.

Select heating assembly based on minimum steam pressure available.

Refer to Selection Chart I, II or III (Page 3) and select heating assembly to fit temperature rise requirement from Step 1. Chart II indicates use of a Model TH4E is good for a 105° F temperature rise. Enter the heating assembly model number in fourth position of system model number.

#### NOTE

For sizing high pressure returns diffuser tube, or heating assemblies requiring capacities not shown on charts, consult factory representative.

# **THERMA-FEED HEATING ASSEMBLY SELECTION CHARTS**

Refer to chart showing applicable temperature rise requirement.  
Enter chart from left at total boiler horsepower (H.P.) load to be  
heated and move horizontally to minimum steam supply

pressure column that suits job requirement. Enter this model  
number into last position of complete system model number.

## **SELECTION CHART I**

50° F. BLEND TEMPERATURE (155° F. TEMP. RISE)

BOILER H.P.	MINIMUM STEAM SUPPLY PRESSURE, PSIG													
	6-7	9	10	12	15	20	30	50	60	75	100	125	150	
100	TL8C	TL5C	TL5C		TL4C	TH5C	TH4C	TH3C			TH2C			
150	TL10D	TL6D			TL5D	TH5D		TH4D			TH3D			
200	TL10E	TL8E			TL6E	TH6E	TH6E	TH5E		TH4E		TH3E	TH3E	
250	TL12E	TL10E	TL8E			TH8E		TH5E			TH4E			
300	TL12F	TL10F		TL8F	TL8F	TH8F		TH6F	TH5F	TH5F	TH4F	TH4F		
350	TL16F	TL10F				TH10F	TH8F	TH6F			TH5F			
400	TL16G	TL12G	TL10G			TH10G	TH8G		TH6G		TH5G	TH4G		
500	TL20G	TL12G		TL10G		TH12G	TH10G	TH8G		TH6G	TH6G	TH5G		
600		TL16G	TL12G					TH8G						
800			TL16FF					TH10FF		TH8FF		TH6FF		
1000				TL16GG				TH12GG	TH10GG		TH8GG	TH6GG		
1200				TL20GG	TL16GG					TH10GG		TH8GG		
1800														

## **ELECTION CHART II**

100° F. BLEND TEMPERATURE (105° F. TEMP. RISE)

BOILER H.P.	MINIMUM STEAM SUPPLY PRESSURE													
	6-7	9	10	12	15	20	30	50	60	75	100	125	150	
100	TL6B	TL5B	TL4B			TH4B	TH3B			TH2B				
150	TL8C	TL5C			TL4C	TH5C	TH4C	TH3C			TH2C			
200	TL8D	TL6D		TL5D		TH5D		TH4D		TH3D			TH2D	
250	TL10D	TL8D	TL6D			TH6D	TH5D	TH4D			TH3D			
300	TL10E	TL8E			TL6E	TH6E	TH5E		TH4E			TH3E		
350	TL12E					TH8E	TH6E	TH5E		TH4E				
400	TL12F	TL10F	TL8F			TH8F	TH6F	TH5F			TH4F		TH3F	
500	TL16F	TL10F			TL8F	TH8F		TH6F		TH5F		TH4F		
600	TL16G	TL12G	TL10G			TH10G	TH8G		TH6G		TH5G		TH4G	
800	TL20G	TL12G			TL10G	TH12G	TH10G	TH8G		TH6G		TH5G		
1000		TL16FF		TL12FF		TH12FF		TH10F	TH8FF		TH6FF		TH5FF	
1200		TL20GG	TL16GG		TL12GG	TH16GG	TH12GG	TH10GG		TH8GG		TH6GG		
1800			TL20GG			TH16GG	TH12GG	TH10GG			TH8GG			

## **SELECTION CHART III**

150 ° F. BLEND TEMPERATURE (55° F. TEMP. RISE)

BOILER H.P.	MINIMUM STEAM SUPPLY PRESSURE													
	6-7	9	10	12	15	20	30	50	60	75	100	125	150	
100	TL4A	TL3A				TH3A	TH2A							
150	TL5B	TL4B		TL3B		TH3B		TH2B						
200	TL6B	TL5B	TL4B			TH4B	TH3B			TH2B				
250	TL6C	TL5C			TL4C	TH4C		TH3C			TH2C			
300	TL8D	TL6D	TL5D			TH5D	TH4D	TH3D				TH2D		
350		TL6D		TL5D		TH5D		TH4D	TH3D			TH2D		
400		TL6D			TL5D			TH4D		TH3D				TH2D
500	TL10E	TL8E		TL6E		TH6E	TH5E	TH4E			TH3E			
600		TL8E			TL6E	TH6E		TH5E		TH4E		TH3E		
800		TL12F	TL10F		TL8F		TH8F		TH6F	TH5F		TH4F		
1000	TL16F	TL10F			TL8F	TH10F	TH8F	TH6F		TH5F		TH4F		
1200	TL16EE	TL12EE		TL10EE		TH10EE	TH8EE		TH6EE		TH5EE		TH4EE	
1800		TL16FF		TL12FF		TH12FF		TH10FF	TH8FF		TH6FF		TH5FF	



## STANDARD EQUIPMENT & ACCESSORIES FURNISHED

Receiver mounted on structural steel support stand.  
Epoxy-phenolic lining and magnesium anode.  
Redline water gauge set.  
Receiver temperature gauge.  
Internal overflow trap.  
Receiver drain valve.  
Manhole, 16" I.D. (2 handholes if less than 36" dia.)  
Makeup level control with inlet valve and strainer.  
Steam flow control valve, pneumatic.  
Pressure-temperature pilot with pneumatic thermostat.  
Stainless steel main steam diffuser tube.  
Steam inlet strainer.  
Boiler feed pump(s) and driving motor(s)  
Pump suction piping with gate valve and flexible connector  
All equipment factory installed and operationally tested.

## SUGGESTED SPECIFICATIONS THERMA-FEED BOILER FEED SYSTEM

Furnish and install in accordance with plans and specifications one (1) pre-heating type vented boiler feed system. System shall be Model Number T-\_\_\_\_\_, \_\_\_\_\_ as manufactured by the Sellers Engineering Company for a boiler operating pressure of \_\_\_\_\_ p.s.i. System shall provide for \_\_\_\_\_ (Qty.) boilers each of \_\_\_\_\_ (H.P.)(lbs./hr.) capacity.

- a. Receiver shall be \_\_\_\_\_" diameter x \_\_\_\_\_" long or have a minimum storage capacity of \_\_\_\_\_ gallons to overflow (whichever is greater). Receiver shall be not less than 1/4" thick. Receiver head to be not less than 3/8" thick.
  - b. Provide openings in receiver for specified accessories plus (2) baffled condensate return openings in top.
  - c. Provide 16" I.D. manhole. 30" and smaller units may have (2) handholes in lieu of manholes.
  - d. Receiver interior to be sandblasted and lined with baked-on epoxy phenolic lining. One replaceable magnesium anode shall be furnished. (Temporary or galvanized linings not acceptable).
- (Optional): Receiver shall be insulated with 2" of fiberglass and covered with a steel jacket. A hardtop walkway shall be furnished to allow personnel to walk on top of receiver without denting steel jacket.
- e. Provide 48" high structural steel support stand with integral pump base channels for boiler feed pumps.
  - f. Provide makeup feeder, McDonnell-Miller No. 21 to supply 17 gpm at 40 p.s.i. supply pressure. If system has a capacity of 300 HP (20 gpm) or larger, provide solenoid makeup valve in lieu of feeder. Valve to have 150 psi brass body sized for 100% capacity operation with 40 psi inlet water pressure.
  - g. Furnish \_\_\_\_\_ (Qty.) centrifugal boiler feed pumps, each having a capacity of \_\_\_\_\_ GPM at \_\_\_\_\_ psi discharge pressure. Driving motors shall be \_\_\_\_\_ HP, \_\_\_\_\_ Volts, \_\_\_\_\_ Phase, 60 Hertz, 3500 RPM, close coupled.

Boiler feed pumps shall not cavitate nor overload driving motor beyond its allowable service factor at any point between 0 and 150% of the specified capacity. Pump curves showing required NPSH shall be furnished. Pumps shall not require more than 3 ft. of NPSH at specified capacity with 210 deg. water. If NPSH requirements exceed 3 ft., stand height is to be increased. Pumps to be bronze or stainless steel fitted.

Boiler feed pumps sets shall be mounted on a steel channel base, and shall be equipped with 250° F mechanical shaft seals. Packed pumps will not be accepted. A liquid filled pressure gauge shall be installed on each pump discharge line. Pump suction line shall include valve and Dresser coupling.

- h. Furnish NEMA 1 unified feed front panels designed to accommodate specified pump(s) driving motor starters and controls. Each control panel circuit shall include a disconnect switch with external operator to interrupt power supplied to the panel before the door is opened. The control panels shall each require only one external power source.

A motor starting circuit shall be provided for each motor. For each pump, provide an integral starter with circuit breaker, horsepower rated for the pump motor size, indicating light and an HOA selector switch. Panels shall include a 115 Volt control circuit transformer with power switch, indicating lights and other necessary controls to constitute a unitized control center. The panels shall be factory mounted and wired and shall be internally prewired and in accordance with the National Electrical Code. Control panels further be fabricated in accordance with and be listed by Underwriters Laboratories.

- i. Piping trains, factory installed, shall include overflow and drain, pump suction, and steam valve.
- j. Furnish heating assembly to raise \_\_\_\_\_ GPM from \_\_\_\_\_ ° F. to 205° F. using \_\_\_\_\_ psi minimum steam pressure. Include pneumatic pilot operated modulating temperature and pressure regulating steam valve with stainless steel trim, 100% shut-off capability. Include strainer, brass or stainless steel steam tube and temperature sensor sensitive to 1/2 ° F.
- k. Accessories furnished and installed on system shall include:
  - (1) Temperature gauge, 3" stainless steel dial type, located in receiver.
  - (2) Pressure gauges, 4 1/2" dial type with brass siphon, located on steam and makeup line.
  - (3) Water gauge set with safety brass cocks.
  - (4) Strainer for makeup line.
  - (5) Air pressure reducing valve and filter assembly.
  - (6) Internal overflow trap.
  - (7) Tank drain valve.
  - (8) (Optional): Probe type of low level alarm and pump cutoff switch.
  - (9) (Optional): Pump discharge shall be equipped with factory piped check valve and balancing cock. Pump discharge returns shall be factory cross piped as shown on plans.
  - (10) (Optional): High pressure tube shall be provided and capable of handling \_\_\_\_\_ lbs./hr. return at \_\_\_\_\_ ° F. Diffuser shall be stainless steel construction and include a double tapped mounting bushing.

- l. Manufacturer shall warrant all parts furnished for eighteen (18) months from date of Therma-Feed Boiler Feed System shipment.
- m. System shall be completely prefabricated, piped, wired and undergo a functional factory test and inspection prior to shipment. System shall be tested with a full steam supply. Owner, engineer or purchaser shall be allowed to witness tests, if desired.
- n. The services of a factory representative shall be made available at the job site to instruct the contractor and/or plant personnel in recommended installation, start up, operation and maintenance procedures. Manufacturer shall assume undivided responsibility for the entire unit. Two perfect bound owner's manuals shall be furnished.
- o. Alternate but equal equipment may be offered providing written approval is obtained ten (10) days before bid date.